LOAD FORECAST

1984-2000

THE NEW BRUNSWICK ELECTRIC POWER COMMISSION

STRATEGIC DEVELOPMENT

SEP. 1984

FOREWORD

An outlook for the current year and a fifteen year forecast of the most probable in-province electrical load to be supplied by the New Brunswick Electric Power Commission (NB Power) is presented in this document. This document is prepared annually and is a major input in NB Power's ongoing planning process. It is based on the current assessment of economic, demographic, technological and related factors which affect the electrical demand in New Brunswick.

This 1984 forecast of peak demand and energy requirements is somewhat higher than that prepared in 1983. The resulting average annual rate of increase in energy sales to the year 2000 is 2.99%. This compares to the 1983 forecast of 2.56% annual increase up to 1998. The difference is primarily the result of a higher forecast of residential sales, resulting from stabilization in fuel wood use and an increase in the forecast of oil to electric space heat conversions.

The forecast does not account for the cyclical nature of the New Brunswick's resource based industry, especially the electric intensive pulp and paper industry. During the forecast period swings in demand for certain products will most likely occur as has been experienced in the past. The uncertainty associated with the timing and duration of such swings and the fact that the resulting fluctuations have no real bearing on NB Power's long term planning constitute a rationale for forecasting industrial loads at historical "normal" levels.

NB Power is in the process of developing a marketing initiative for its customers. The effect of this program on the load forecast has not yet been fully identified. Over time as the effect on the potential markets is identified it will be considered in more detail. This forecast reflects what is considered most probable outlook at this time. A sensitivity analysis has been done to show the effects of deviations in specific forecast parameters.

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The total in province electrical energy (system net) is forecast to increase from 9261 GW.h in the most recent fiscal year (1983/84) to 14841 GW.h by 1999/2000. The compound average annual growth rate for the entire sixteen year period is 2.99 percent.

The system net peak demand of 1702 MW in the fiscal year 1983/84 is forecast to increase to 2779 MW by 1999/2000. The compound average annual growth rate over the entire sixteen year period is 3.11 percent.

The system net energy and peak demand increased by 15.9 and 18.4 percent respectively during the last fiscal year 1983/84. This large increase was mainly due to: (i) the economic recovery, especially for the electric intensive pulp and paper industry, (ii) the modernization and expansion at two pulp and paper mills, (iii) production start up at two new mines and (iv) the addition of some 11,000 electrically heated residences; 6100 off-oil conversions and almost 5000 new homes.

Further recovery of the pulp and paper industry to its historical maximum operating levels is expected (and being experienced) in the current fiscal year 1984/85. Residential off-oil conversions to electricity are maintaining the annual rate of 6000 while nearly all of the new homes are forecast to opt for electricity as a principal space heating fuel. The resulting forecast growth rates for the system net energy and peak demand in the current year are 8.2 and 7.6 percent respectively.

The overall end result of this 1984 load forecast is higher than the previous (1983) forecast. Table 1 below compares the end result of the two forecasts and their respective growth rates based on a common denominator, the fiscal year 1983/84.

TABLE 1

COMPARISON OF 1983 AND 1984 FORECAST RESULTS

FISCAL YEAR	SYSTEM NET ELECTRICAL LOAD ENERGY (GW.h)	PEAK DEMAND (MW)	TOTAL PERIOD AVERAGE ANNUAL GROWTH RATE (%) ENERGY	PEAK DEMAND
1983/84 (actual)	9,261	1,702		
1997/98 (83 F'cst)	13,191	2,454(1)	2.56	2.65
1999/2000 (84 F'cst)	14,841	2,779	2.99	3.11

A large part of the change between the 1983 and 1984 system net energy forecasts is in the sales to the Residential classification (see Table 2). The heat sensitive nature of the residential load has a greater impact on the energy sales in the winter months as compared to summer months and subsequently the peak demand on our winter peaking system is forecast to grow somewhat faster than the system net energy.

The 1983 forecast of a peak demand of 2454 MW by the fiscal year 1997/98 is comparable to the 1984 forecast for the fiscal year 1993/94 resulting in a four year shift. In comparison the 1983 forecast of system net energy supply of 13,191 GW.h in 1997/98 is now forecast to be realized three years earlier in 1994/95. The maximum monthly energy supply which usually occurs in January is forecast to shift forward by some five years (January 1998 energy supply of 1375 GW.h forecast in 1983 compares to the 1984 forecast of 1365 GW.h supply in January 1993).

The 1983 and 1984 forecasts of total New Brunswick energy sales to the three major customer categories (including energy sold by municipal

(1) Adjusted upwards by 30 MW to include interruptible demand which had been excluded from the forecasts up to 1983.

utilities) are compared for the fiscal year 1997/98 (the latest comparable period) in Table 2 below. Following Table 2 is a brief explanation of the methodology and key input changes for each of the three customer categories.

TABLE 2

1983 AND 1984 FORECAST RESULTS FOR MAJOR CATEGORIES

	FISCAL YEAR 1997/98		
	1983 Forecast	1984 Forecast	Difference
Residential (GW.h)	3,994	4,622	628
General Service (GW.h)	2,258	2,366	108
Industrial Transmission(GW.h)	5,225	5,272	47

RESIDENTIAL

The "end use" forecast model used over the last several years continues to be reliable in explaining the changes in residential load and has therefore been used again in this forecast. The model is based on a forecast of the number of customers and energy use per customer. Key input changes from the previous (1983) forecast are outlined below.

(a) Households: A review of households forecast indicated that NB Power projections are low in comparison to estimates made by other agencies including Statistics Canada and the provincial department of the Energy Secretariat. NB Power's previous forecast of growth in headship rate (a measure of the household formation rate) was found to be consistently low and therefore reviewed and revised; resulting in an increase of some 4,400 households by 1997/98.

(b) Electric Space Heating: Oil to electric space heat conversions continue to exceed forecast levels. Some 6100 conversions in the fiscal year 1983/84 compare to a forecast of 5000. The forecast of conversions has been revised upwards in view of recent trends. By 1997/98 the total number of off-oil conversions in this 1984 forecast are 5000 more than the conversion in the previous forecast.

Electric heat penetration into new construction has been revised upwards from 80% in the previous forecast to 100%. This change is consistent with the finding that the amount of wood used for space heating has now stabilized. Some new homes may use wood for space heating but this is expected to be offset by corresponding reduction of wood use in existing homes.

Another key effect of stabilization of wood use is the amount of electrical energy needed for space heating. The 13,266 kW.h per home for fiscal 1983/84 used in the 1983 forecast was based on the assumption that the extent of wood usage in new homes, for supplementary heating, would be the same as in existing homes. This input is now changed to zero additional wood use, thus effectively increasing the average space heating energy needs of an electrically heated home to be 13,742 kW.h in the year 1983/84. The effect of no further increase in wood use is to increase the average space heating requirements of an electrically heated home to 14,061 kW.h/year, by 1997/98, (compared to 12,367 kW.h in the 1983 forecast) even after providing for a 0.5% annual reduction due to conservation efforts.

The assumption of no increase in wood use for space heating over the forecast period has had the greatest impact on the forecast, accounting for more than one half of the residential forecast increase shown in the preceeding Table 2.

The residential forecast is based on an assumption of "normal" (average of past 30 years) weather conditions over the forecast period. The actual electrical load will therefore differ by at least the difference between actual and "normal" weather during any given period.

GENERAL SERVICE

The econometric model used in the previous forecast was updated to include revised and additional economic and energy data. This econometric model correlates per capita general service sales to per capita real personal disposable income. The effect of change in per capita real personal disposable income on the per capita general service sales is now higher than in the previous forecast resulting in an upward revision of the total forecast.

INDUSTRIAL TRANSMISSION

The methodology developed in the 1983 forecast, i.e. a review and analysis of each major industry group, has also been used in this forecast. Additional work in this area included (i) an analysis of the potential long term demand for the products, particularly those produced by the pulp and paper industry and (ii) a review of the load implications of additions, expansions and technological changes. Key considerations for the wood processing and mining industries, which together account for some 90% of the industrial transmission load, are summarized below.

(a) Wood Processing: Most of the electrical sales (97%) to this industry group are to the pulp and paper producers. Forecast of pulp and paper industry's electrical needs is based on (i) availability of the resource, i.e. softwood and hardwood, (ii) demand for pulp and paper products, (iii) effects of further processing, e.g. producing paper where pulp is the final product at present, (iv) modernization plans leading to increased electrification and (v) technological developments especially related to

utilization of waste heat in exhaust steam through heat pumps. A re-evaluation of these factors has led to a somewhat higher forecast for the industry. See Appendix C for more details.

(b) Mining: Forecast of mining and smelting load is based on a probability analysis of (i) the potential for new mines, (ii) reopening of existing mines closed by decline in world prices of base metals and (iii) the potential for further electrification of the mining industry by application of new electro-technologies. See Appendix D for more details.

The ultimate commercial applications of new electro-technologies, such as heat pumps for heat recovery and plasma technology for drying processes, can affect the future industrial electrical loads. To this extent the work now being done as a part of the NB Power marketing initiative will help identify the potential applications for these technologies. Magnitude of the impact of these technologies will be refined over time.

OVERALL RESULTS

The total system net energy and peak demand forecast for each of the next sixteen years is shown in Table 3 and compared to the corresponding 1983 forecast in Figure 1.

84-08-31

TABLE 3

SUMMARY OF OVERALL RESULTS

FISCAL YEAR	SYSTEM NET ENERGY (GW.h)	PEAK HOURLY DEMAND (MW)
1983/84 (actual)	9,261	1,702
1984/85 (outlook)	10,017	1,832
1985/86	10,344	1,894
1986/87	10,682	1,968
1987/88	11,068	2,051
1988/89	11,476	2,134
1989/90	11,806	2,201
1990/91	12,070	2,255
1991/92	12,374	2,314
1992/93	12,675	2,372
1993/94	12,971	2,428
1994/95	13,263	2,484
1995/96	13,631	2,553
1996/97	13,927	2,608
1997/98	14,225	2,664
1998/99	14,532	2,720
1999/2000	14,841	2,779

COMPARISON OF 1983 AND 1984 FORECASTS

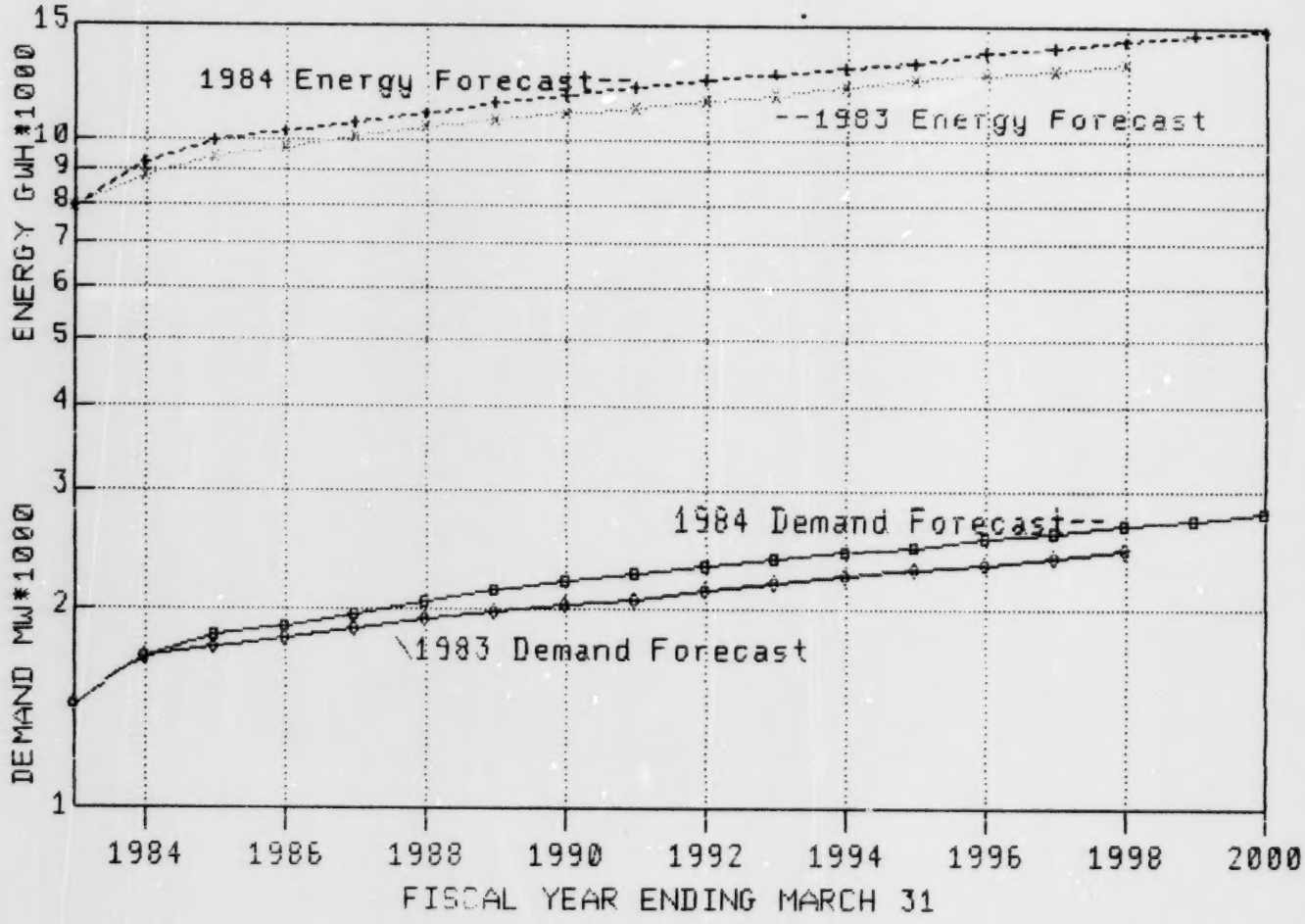


FIGURE 1

1984 LOAD FORECAST

INTRODUCTION

This document presents the methodology and results of the forecast of electrical power needs in New Brunswick. The forecast covers the fiscal year period 1984/85 to 1999/2000 and includes a forecast of:

1) Annual electrical energy requirements of each of the six in-province customer classifications and the related distribution and transmission losses.

2) Total in-province energy by month.

3) System peak hourly demand by month.

Flow diagram in Figure 2 outlines the energy forecast methodology used for each of the six customer classifications; Residential, General Service, Industrial Distribution, Street Lights, Wholesale (for Resale) and Industrial Transmission. Figure 2 is followed by an overview of the forecast results and the forecast details in succeeding sections of this report.

Some of the background material related to the details of methodology and inputs is given in Appendix A to D which are referenced in this main report.

FORECAST METHODOLOGY

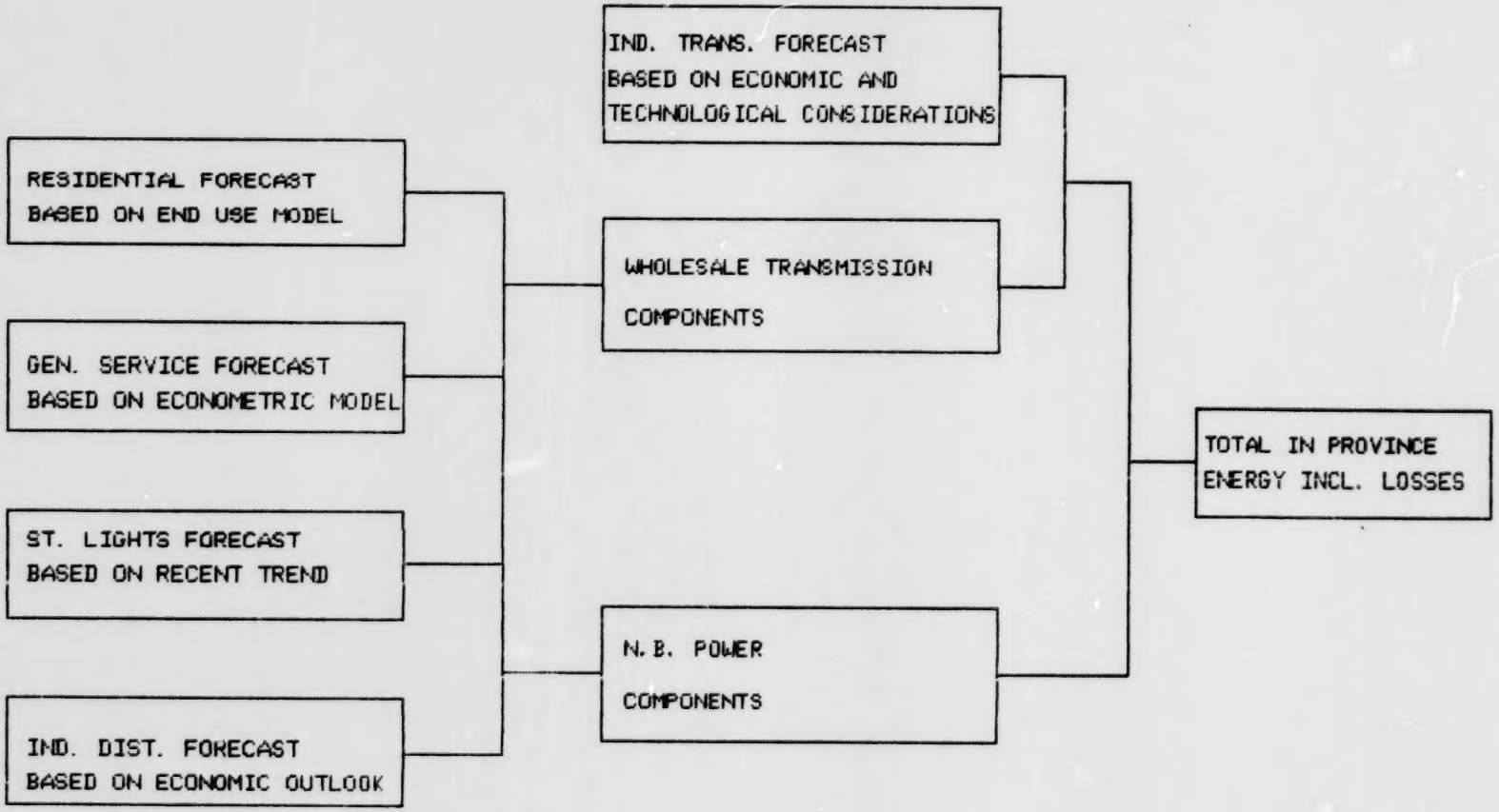


FIGURE 2

OVERVIEW OF FORECAST RESULTS

New Brunswick's annual electrical requirements are forecast to increase from 9261 GW.h in the most recent fiscal year (1983/84) to 12,374 GW.h by 1991/92 and 14,841 GW.h by 1999/2000. The compound average annual growth rates for the corresponding eight and sixteen year periods are 3.69 and 2.99 percent. Higher average growth in the earlier years reflects the current trend and expectations for residential oil to electric space heating conversions and the recovery by 1984/85 of the industrial sales reduction due to the economic recession, in 1982 and 1983.

Table 4 summarizes the absolute and percentage growth in energy sales by customer classification. Growth rates of 3.44% for Residential and 3.14% for the Wholesale classification are above the overall average of 2.99%. Figure 3 depicts the annual energy sales forecast and the relative magnitude of sales to each classification.

The relative increase in the proportion of the heat sensitive residential sales means a higher proportion of annual sales will be in the winter months and subsequently the demand on NB Power's winter peaking system is forecast to grow somewhat faster than the energy supply.

The system net peak demand is forecast to grow from an actual level of 1702 MW in the fiscal year 1983/84 to 2314 MW by 1991/92 and 2779 MW by 1999/2000. The respective compound average annual growth rates over the eight and sixteen year periods are 3.91 and 3.11 percent. The resulting annual load factor is forecast to decline from the 1983/84 level of 62.1% to 61.0% at the end of the sixteen year forecast period. The annual forecast of energy by customer classification, peak hourly demand and the load factor is given in Table 5.

The overall load growth in this 1984 forecast is higher than in the previous (1983) forecast (Figure 4 and 5). The net effect of the forecast difference is that the 1983 forecast of system net peak demand

TABLE 4

FORECAST GROWTH SUMMARRY

	RESI-DENTIAL	GEN. SERVICE	STREET LIGHTS	IND. DIST.	IND. TRANS.	WHOLE-SALE	LOSSES	SYSTEM NET
1983/84 SALES(gWh)	2486	1227	53	311	3560	744	880	9261
% OF SYSTEM NET	26.8	13.2	0.6	3.4	38.4	8.0	9.5	100.0
GROWTH BY 1999/2000	1783	725	19	165	1935	476	477	5580
%OF SYSTEM NET GROWTH	32.0	13.0	0.3	3.0	34.7	8.5	8.5	100.0
1999/2000 SALES(gWh)	4269	1952	73	476	5495	1220	1357	14841
% OF SYSTEM NET	28.8	13.2	0.5	3.2	37.0	8.2	9.1	100.0
ANNUAL GROWTH(%/YR.)	3.44	2.94	1.94	2.70	2.75	3.14	2.74	2.99

in 1997/98 is now expected to occur almost four years sooner and the corresponding energy supply will be realized three years earlier in 1994/95.

The following sections elaborate on the forecast of annual energy for each customer classification, total monthly energy and system peak hourly demand by month.

FIGURE 3

ENERGY SALES BY CUSTOMER CLASSIFICATION

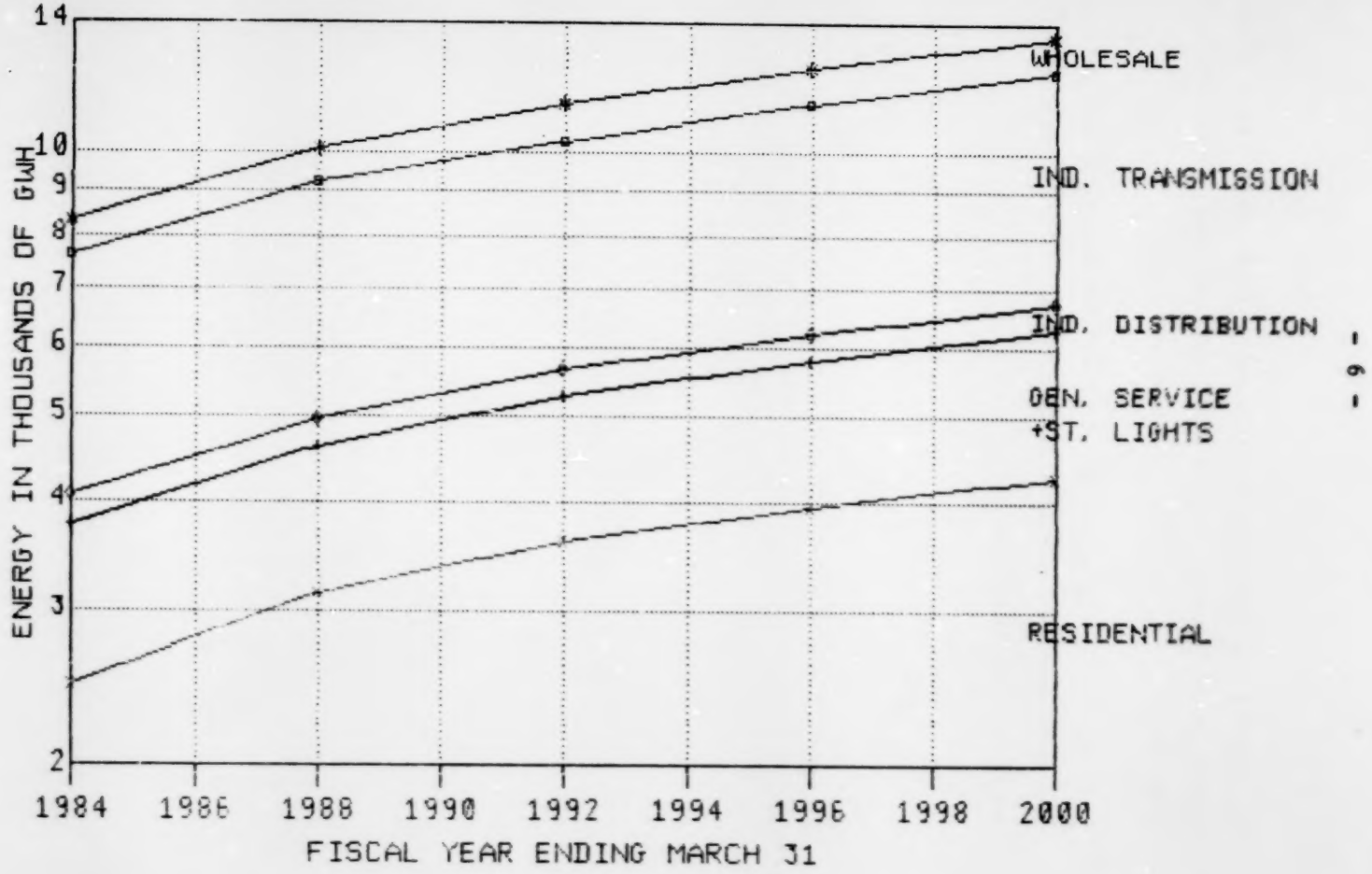


TABLE 5

ANNUAL ENERGY, PEAK DEMAND AND LOAD FACTOR FORECAST

FISCAL YEAR	IN PROVINCE ENERGY SUPPLY (GWH) RESI-DENTIAL	GEN. SERVICE	STREET LIGHTS	IND. DIST.	IND. TRANS.	WHOLE-SALE	LOSSES	SYSTEM NET	HORLY PEAK DEM. (MW)	ANNUAL LOAD FACTOR(%)
1983/84	2486	1227	53	311	3560	744	880	9261	1702	62.1
1984/85	2664	1273	55	321	3974	782	949	10017	1832	62.4
1985/86	2840	1322	56	329	4095	821	882	10344	1894	62.4
1986/87	3001	1373	57	337	4141	858	915	10682	1968	62.0
1987/88	3157	1424	58	346	4236	896	952	11068	2051	61.6
1988/89	3294	1464	59	354	4335	926	1044	11476	2134	61.4
1989/90	3411	1504	61	365	4435	955	1076	11806	2201	61.2
1990/91	3525	1545	62	376	4536	984	1043	12070	2255	61.1
1991/92	3620	1587	63	387	4637	1011	1070	12374	2314	61.0
1992/93	3710	1629	64	399	4740	1037	1096	12675	2372	61.0
1993/94	3794	1673	65	411	4844	1062	1122	12971	2428	61.0
1994/95	3875	1716	67	421	4949	1088	1148	13263	2484	61.0
1995/96	3955	1761	68	432	5056	1114	1246	13631	2553	61.0
1996/97	4034	1806	69	442	5164	1139	1273	13927	2608	61.0
1997/98	4112	1852	70	453	5273	1165	1301	14225	2664	61.0
1998/99	4190	1902	71	465	5383	1192	1329	14532	2720	61.0
99/2000	4269	1952	73	476	5495	1220	1357	14841	2779	61.0
ANNUAL GROWTH RATE(%/YR.)	3.44	2.94	1.94	2.70	2.75	3.14	2.74	2.99	3.11	-0.12

FIGURE 4

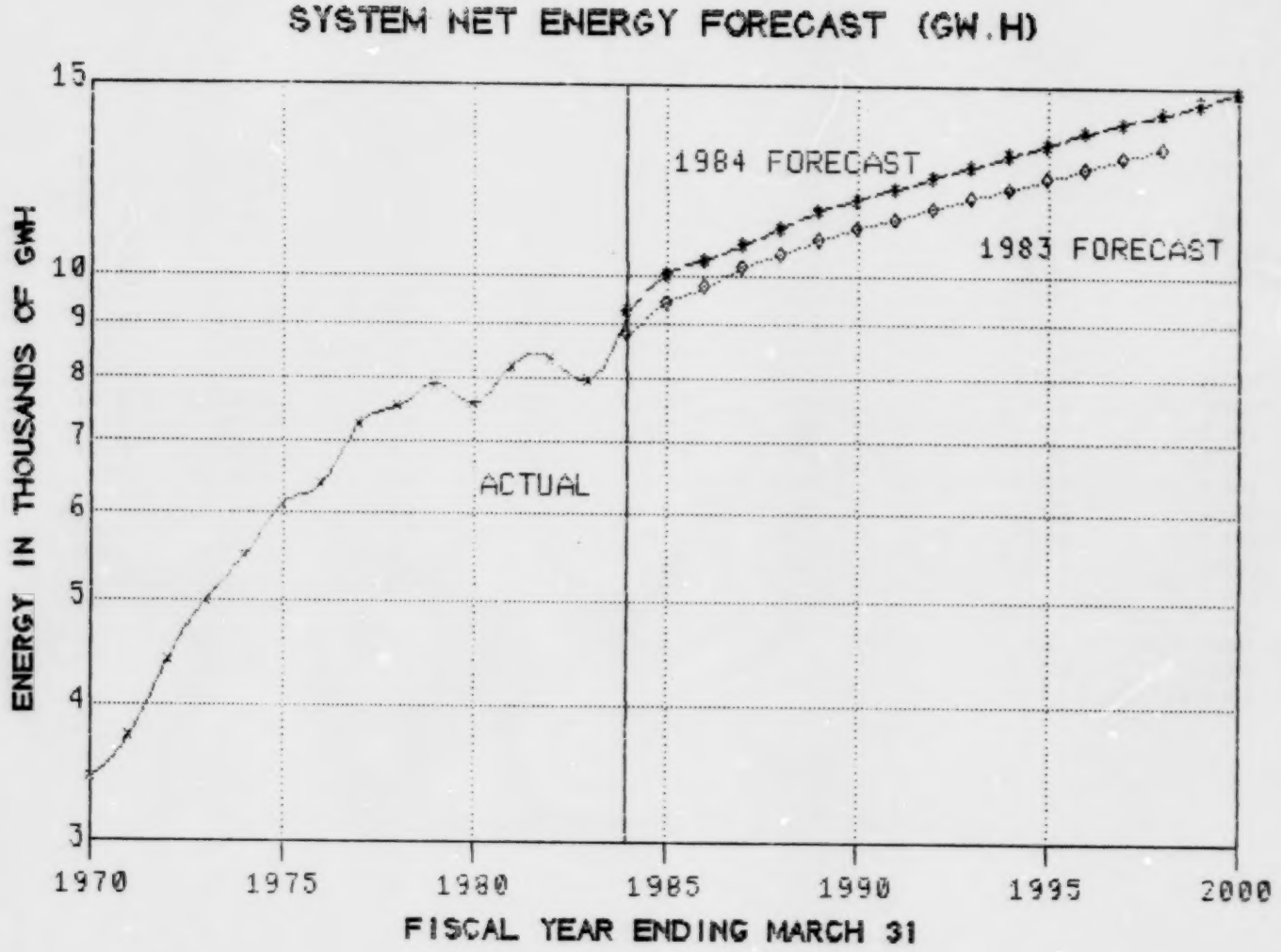
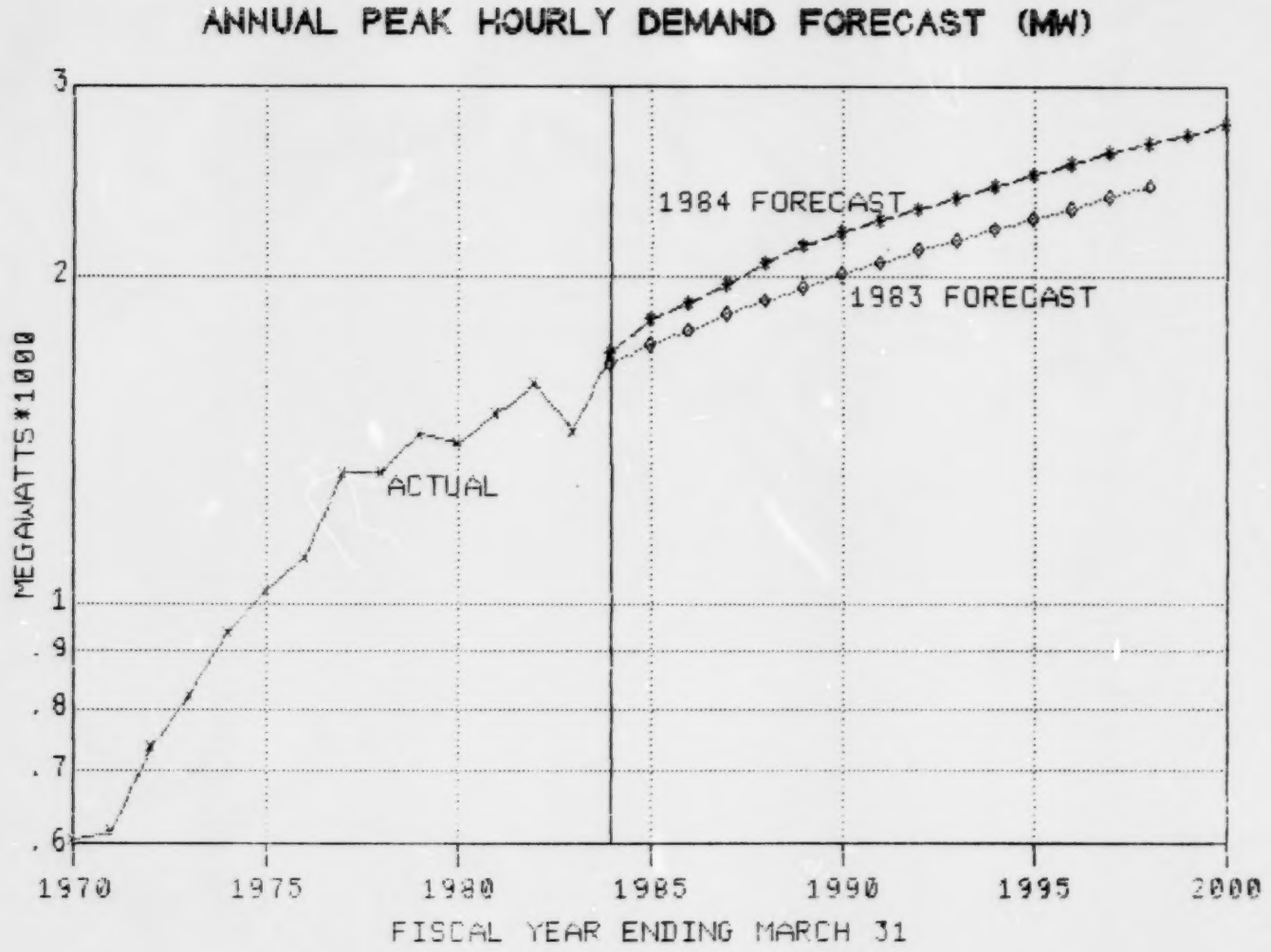

SYSTEM NET ENERGY FORECAST (GW.H)
ENERGY IN THOUSANDS OF GWH
15
10
9
8
7
6
5
4
3
1984 FORECAST
1983 FORECAST
ACTUAL
1970
1975
1980
1985
1990
1995
2000
FISCAL YEAR ENDING MARCH 31

FIGURE 5


ANNUAL PEAK HOURLY DEMAND FORECAST (MW)
MEGAWATTS*1000
3
2
1
.9
.8
.7
.6
1984 FORECAST
1983 FORECAST
ACTUAL
1970
1975
1980
1985
1990
1995
2000
FISCAL YEAR ENDING MARCH 31

ENERGY FORECAST BY CUSTOMER CLASSIFICATION

1. RESIDENTIAL

NB Power residential classification comprises mainly of some 200,000 year-round (mostly domestic) and 15,000 seasonal customers using electricity for household applications such as cooking, refrigeration, water heating and space heating. Churches and farms are also included in this group. In addition the municipal utilities in Saint John and Edmundston serve some 30,000 residential customers.

The electrical energy requirements of the residential customers have tripled during the twelve year period 1972 to 1984. This represents an average annual growth rate of 9.6 percent. The growth over the period has not been uniform; with the average annual rate of 17.4% in the first five years, 2.7% over the next five years and 8.3% during the last two years. Table 6 below shows the residential growth pattern and includes corresponding changes in two of the key factors, namely electric space heat and the number of customers, which have contributed to the fluctuation in the growth rate.

TABLE 6

RESIDENTIAL GROWTH HISTORY

FISCAL YEAR	RESIDENTIAL SALES (GW.h)	AVERAGE ANNUAL SALES GROWTH RATE (%)	AVERAGE ANNUAL[1] INCREASE IN ELEC. HEAT SATURATION (%)	AVERAGE ANNUAL[2] INCREASE IN NO. OF CUSTOMERS
1971/72	935			
1976/77	2084	17.4	3.0	8001
1981/82	2382	2.7	1.8	4251
1983/84	2794	8.3	3.6	3054

(1) Based on NB Power Appliance Saturation Surveys between 1970 and 1981
(2) Based on NB Power and municipal utilities records of number of customers.

Other factors which have contributed to the fluctuation in residential growth, but cannot be quantified, include (i) increased use of wood particularly as supplement to electric space heating especially during the late seventies and (ii) customer efforts to reduce energy use as evidenced by several consumer studies and the success of many federal and provincial government programs designed to encourage energy conservation.

The residential energy is forecast for its two components, i.e. year-round customers (households, farms and churches accounting for almost 99% of the residential sales) and seasonal customers. The forecast of year-round customers' needs is based on an "end use" model which can be simply stated as:

ENERGY (kW.h) = NUMBER OF YEAR-ROUND CUSTOMERS
X AVERAGE USE PER CUSTOMER

Seasonal customer consumption is forecast by extrapolating historical data.

Forecast of the number of year-round customers (households) is dependent on projections of population and household size. Use per customer is determined by the estimates of number of major electrical appliances (or equipment) and the average use per appliance.

The number of year-round residential classified customers is forecast to increase from the 1983/84 level of 231,333 to 273,065 by 1999/2000; an average of increase of 2608 customers per year. This forecast growth, though much below the actual average increase of 5689 customers per year experienced since 1972, is in line with recent trends (3382 per year over the last five years) reflecting the slowing rate of: (i) the population growth and (ii) the decline in number of people per household (see Appendix A for details).

The average annual consumption of year-round customers is forecast to grow by 44% from 11,946 kW.h experienced in 1983/84 to 17,198 kW.h by

the end of the fifteen year forecast period. In comparison the consumption per customer more than doubled (from 5611 kW.h to 11946) over the past twelve years. The slower rate of forecast growth reflects (i) near saturation of most electrical appliances and (ii) the effect of energy conservation particularly as it relates to space heating energy requirements.

The saturation of electric space heating is forecast to grow from 31.1% in 1983/84 to 61.2% by the year 1999/2000. This will be in large part due to forecast of 62,000 oil to electric space heat conversions over the sixteen years. Off-oil conversion activity is supported by a federal government grant, of up to $800, and has already led to some 17,000 conversions since the implementation of the program in May, 1981. Electric space heating penetration into new construction is forecast to average 80% (100% till 1987/88 declining gradually thereafter to 65% by 1993/94 due to forecast availability of natural gas in the province).

The forecast of 100 percent electric heat penetration in new construction up to 1987/88 is higher than the 80 percent penetration rate used in the previous forecast. The change reflects the stabilization of fuel wood use in the residential market as evidenced by usage data[3]. The stability of wood use also effects the amount of electrical energy needed for space heating. No additional wood use assumption changes the average space heating electrical energy needs of a new home from 13,300 kW.h in the previous (1983) forecast to 17,500 kW.h per year[4]. The effect of this change is to increase the average annual space heating requirements for space heating from the current (1983/84) estimate of 13,742 kW.h/year to some 14,061 kW.h/year by 1997/98 (compared to 12,367 in the 1983 forecast), even after providing for a 0.5% annual reduction due to conservation efforts.

(3) See Statistics Canada Catalogue 25-201
(4) Some new homes will use wood for space heating but this is expected to be offset by corresponding reduction of wood use in existing homes.

The effect of forecast increases in electric space heating saturation and energy use is to increase its contribution to the average annual consumption from 35.8% in 1983/84 to 49.0% in 1999/2000 (see Appendix B for details). Other electrical applications, e.g. water heating, stove, refrigerator, freezer etc., will also add to the future residential electrical needs but their combined impact will be less than that due to space heating alone.

The seasonal customer consumption is forecast by extrapolating historical trends of the number of customers and their average annual consumption. Its share of the total residential consumption remains relatively stable at a little over one (1) percent.

The total residential sales forecast is for compound average annual growth of 3.44 percent. NB Power does not retail electricity to all of the residential customers in the province. The portion of the total residential forecast sales expected to be retailed by the municipal utilities in Saint John and Edmundston is determined on the basis of historical data. Tables 7 and 8 present the residential forecast results.

TABLE 7

HISTORY AND FORECAST OF RESIDENTIAL SALES(GWH)

Fiscal Year	NB POWER	WHOLESALE	TOTAL SALES NEW BRUNSWICK
History			
1971-72	785	150	935
1972-73	911	162	1073
1973-74	1072	179	1251
1974-75	1284	203	1487
1975-76	1554	243	1797
1976-77	1809	275	2084
1977-78	1905	278	2183
1978-79	2010	256	2266
1979-80	1975	254	2229
1980-81	2057	255	2312
1981-82	2119	263	2382
1982-83	2226	278	2508
1983-84	2486	308	2794
Forecast			
1984-85	2663	330	2994
1985-86	2840	352	3192
1986-87	3001	372	3373
1987-88	3156	392	3548
1988-89	3294	409	3702
1989-90	3410	423	3833
1990-91	3524	437	3962
1991-92	3620	449	4069
1992-93	3710	460	4170
1993-94	3793	471	4263
1994-95	3874	481	4354
1995-96	3954	491	4445
1996-97	4033	500	4534
1997-98	4111	510	4622
1998-99	4190	520	4710
99-2000	4269	530	4799

TABLE 8

RESIDENTIAL SALES PER PERSON AND PER CUSTOMER

Fiscal Year	Total Sales New Brunswick (kWh*1000000)	N.B. Population	Total* Residential Customers	kWh/Person (1)/(2)	kWh/cust. (1)/(3)
History					
1971-72	935	636,400	174,568	1469	5356
1972-73	1073	642,400	182,300	1670	5886
1973-74	1251	649,300	191,263	1927	6541
1974-75	1487	657,500	200,375	2262	7421
1975-76	1797	669,200	207,549	2685	8658
1976-77	2084	679,600	216,571	3067	9623
1977-78	2183	685,800	223,072	3183	9786
1978-79	2266	690,200	228,425	3283	9920
1979-80	2229	693,800	232,719	3213	9578
1980-81	2312	696,300	236,664	3320	9769
1981-82	2382	698,300	238,787	3411	9975
1982-83	2508	703,700	241,657	3564	10378
1983-84	2794	709,200	246,503	3940	11335
Forecast					
1984-85	2994	714,600	249,969	4189	11976
1985-86	3192	719,900	253,488	4434	12593
1986-87	3373	725,100	257,061	4652	13122
1987-88	3548	730,000	260,472	4860	13621
1988-89	3702	734,800	263,634	5038	14043
1989-90	3833	739,300	266,588	5185	14379
1990-91	3962	743,600	269,594	5328	14695
1991-92	4069	747,800	272,435	5441	14936
1992-93	4170	751,700	275,110	5547	15157
1993-94	4263	755,400	277,574	5644	15360
1994-95	4354	758,900	279,913	5738	15556
1995-96	4445	762,200	282,258	5832	15748
1996-97	4534	765,300	284,522	5924	15935
1997-98	4622	768,400	286,791	6015	16115
1998-99	4710	771,500	289,110	6105	16292
99-2000	4799	774,600	291,435	6195	16465

* Includes seasonal customers.

2. GENERAL SERVICE

This classification comprises all customers who do not specifically fall into residential, industrial or street lighting categories. The general service customers range from a few kilowatts to several thousand kilowatts of connected load. The electric applications for this customer group can also be diverse, ranging for example from basic lighting needs in a small office to lighting, heating, cooling and operation of medical equipment in a hospital.

Sales to New Brunswick's general service customers have more than doubled since the fiscal year 1971/72 - with an average annual increase of 6.9 percent. The growth in the past five years has been much slower at 3.1% per year. This difference in growth rate over the two periods can be linked to (i) differences in economic growth (2.7% vs 0.9%), (ii) population growth (0.9% vs. 0.5%) and (iii) the effect of energy conservation which cannot be quantified but is evident from the success of several federal and provincial government programs aimed at promoting conservation.

Close to 70% of the general service sales are directly linked to economic activity e.g. hotels/motels, retail outlets, offices (Table 10). The remaining 30% of the sales are to the institutional sector including schools, hospitals and government offices. This latter portion is also linked to economic factors in the long run but often influenced by public policy in the short run.

Growth rates for the eight sectors identified in Table 9 differ markedly and hence justify the need for a separate analysis, modelling and forecast of each sector. This exercise would require a larger data base and a better understanding of the pertinent growth (decline) factors for each of the sectors.

As all of the general service sales are directly or indirectly linked to the economic activity, the econometric model used in the previous forecasts is one relevant forecast approach. The existing model

TABLE 9

GENERAL SERVICE SALES AND CUSTOMER HISTORY
BY S.I.C. GROUPS

S.I.C. GROUP\YEAR:		1978/79	1979/80	1980/81	1981/82	1982/83	AVERAGE GROWTH % PER YR
WHOL./RET.	GWH	289	324	337	340	341	3.4
	CUST.	4768	5049	5212	5232	5322	2.2
EDUCATION	GWH	208	209	207	202	196	-1.2
	CUST.	1014	997	940	898	875	-2.9
OFFICES	GWH	217	206	208	205	215	-0.2
	CUST.	2329	2408	2393	2400	2415	0.7
HOTELS/ MOTELS/REST.	GWH	96	106	110	114	116	3.9
	CUST.	1172	1296	1384	1537	1593	6.3
HOSPITALS/ HEALTH SER.	GWH	70	72	72	73	74	1.1
	CUST.	364	382	410	397	403	2.1
APARTMENTS	GWH	42	47	55	58	59	7.0
	CUST.	1252	1329	1521	1554	1541	4.2
WAREHOUSES	GWH	13	15	15	16	17	5.5
	CUST.	650	698	718	725	753	3.0
OTHER	GWH	137	139	161	161	166	3.9
	CUST.	4293	4450	4511	4524	4604	1.4
TOTAL	GWH	1072	1118	1165	1169	1184	2.0
	CUST.	15842	16609	17089	17267	17506	2.0

DATA SOURCE: BASED ON AN ANALYSIS OF CUSTOMER CONSUMPTION DATA BY SIC CODES

was updated with revised and additional electrical energy and economic data. Model results have been consistent with actual experience in the past two years and form the basis of this forecast.

The model defines annual general service sales per capita as a dependent variable while per capita real personal disposable income is used as the independent variable. Forecast growth in per capita real personal disposable income is based on the potential for future growth in real domestic provincial product and takes into account the impact of current trends in wage restraints and the intended freeze of federal government transfer payments (in real dollars) to New Brunswick.

Per capita general service sales forecast is multiplied by the New Brunswick population projection to arrive at the total general service sales forecast. The model results, based on a 1.75% annual increase in per capita real personal disposable income[5] and 0.6% annual growth in population,[6] are adjusted for the potential effects of the natural gas forecast to be available by 1989.

The total general service sales forecast is for a compound average annual growth of 2.94 percent. The portion of the total general service sales expected to be retailed by the municipal utilities is determined on the basis of recent historical data. Tables 10 and 11 present the forecast results.

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(5) See "General Service Forecast, 1983-1999" by Hon-Po Wong, NB Power.
(6) See Residential section and Appendix A for discussion on population projection.

TABLE 10

HISTORY AND FORECAST OF
GENERAL SERVICE SALES

FISCAL YEAR		NB POWER	WHOLESALE	TOTAL SALES NEW BRUNSWICK
1971/72	ACTUAL	540	167	707
1972/73		618	181	799
1973/74		695	200	895
1974/75		775	222	997
1975/76		872	252	1124
1976/77		935	274	1209
1977/78		984	282	1266
1978/79		1072	275	1347
1979/80		1118	288	1406
1980/81		1165	296	1461
1981/82		1169	306	1475
1982/83		1184	323	1507
1983/84		1227	341	1568
1984/85	FORECAST	1273	353	1626
1985/86		1322	366	1689
1986/87		1373	380	1753
1987/88		1424	395	1819
1988/89		1464	406	1869
1989/90		1504	417	1921
1990/91		1545	428	1973
1991/92		1587	440	2027
1992/93		1629	452	2081
1993/94		1673	464	2136
1994/95		1716	476	2192
1995/96		1761	488	2249
1996/97		1806	501	2307
1997/98		1853	514	2366
1998/99		1902	527	2430
99-2000		1953	541	2495

TABLE 11

GENERAL SERVICE SALES PER PERSON

FISCAL YEAR		N.B. POPULATION (Oct 1) NUMBER	N.B. GEN. SER SALES (GWH)	GEN SER SALES PER PERSON (KWH)
1981/82	ACTUAL	698300	1475	2112
1982/83		703700	1507	2141
1983/84		709200	1568	2211
1984/85	FORECAST	714600	1626	2275
1985/86		719900	1689	2346
1986/87		725100	1753	2418
1987/88		730000	1819	2491
1988/89		734800	1869	2544
1989/90		739300	1921	2598
1990/91		743600	1973	2654
1991/92		747800	2027	2710
1992/93		751700	2081	2768
1993/94		755400	2136	2828
1994/95		758900	2192	2889
1995/96		762200	2249	2951
1996/97		765300	2307	3014
1997/98		768400	2366	3080
1998/99		771500	2430	3149
99/2000		774600	2495	3221
AVERAGE ANNUAL GROWTH (%/YR.)		0.6	2.9	2.4

3. INDUSTRIAL DISTRIBUTION

This customer classification comprises of industrial customers served at distribution voltages (12 kV or less) and ranging in size from a few KW to about 3000 KW of connected load. Some 70% of the sales to this customer classification are to manufacturing industries while water and sewage pumping accounts for about 15% of the total sales.

Historical year to year growth rate for the classification has ranged between -6.9% to +10.1% (Table 12). The fluctuations in growth rate have resulted from swings in economy and due to shifts of loads between industrial transmission and distribution classifications.

Key considerations in forecasting Industrial Distribution electrical requirements are: (a) the growth in the provincial economy as measured by the total real domestic provincial product and by its goods producing and manufacturing sector components, (b) potential for conservation and (c) application of new electro-technology to existing industry, e.g. heat pumps and dehumidification heat pump kilns.

The energy sales to this classification are forecast to grow at an overall average rate of 2.7% per year as compared to 4.3% growth in the past 12 years. The difference is due to forecast of slower than past economic growth[7] and the potential for energy conservation, particularly through the use of energy efficient motors which are economically justified for decisions relating to new and replacement motors.[8]

The forecast of total New Brunswick Industrial Distribution sales and its NB Power and Wholesale components is given in Table 13.

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(7) Wong, Hon-Po, General Service Forecast, 1983-1999, NB Power.
(8) Potential of high efficiency motors to save electric energy in Canada, CEA Research Project 016 U 244.

TABLE 12

INDUSTRIAL DISTRIBUTION SALES AND REAL DOMESTIC PROVINCIAL PRODUCT

FISCAL YEAR	INDUSTRIAL DISTRIBUTION SALES(GWH)	ANNUAL GROWTH RATE	REAL DOMESTIC PROVINCIAL PRODUCT* (Millions OF Dollars) Mfg. Sector	ANNUAL GROWTH RATE	Goods Producing Sector	ANNUAL GROWTH RATE	All Industries	ANNUAL GROWTH RATE
1971/72	225		257		557		1611	
1972/73	241	7.1	294	14.4	596	7.0	1730	7.4
1973/74	251	4.1	326	10.9	673	12.9	1896	9.6
1974/75	268	6.8	334	2.5	718	6.7	1980	4.4
1975/76	295	10.1	301	-9.9	693	-3.5	2004	1.2
1976/77	313	6.1	307	2.0	696	0.4	2058	2.7
1977/78	319	1.9	306	-0.3	695	-0.1	2084	1.3
1978/79	341	6.9	321	4.9	722	3.9	2128	2.1
1979/80	364	6.7	332	3.4	736	1.9	2168	1.9
1980/81	379	4.1	339	2.1	706	-4.1	2166	-0.1
1981/82	353	-6.9	315	-7.1	689	-2.4	2173	0.3
1982/83	341	-3.4	299	-5.1	662	-3.9	2159	-0.6
1983/84	371	8.8	308	3.0	694	4.8	2229	3.2
Average Annual Growth (%)		4.3%		1.7%		1.8%		2.7%

TABLE 13

HISTORY AND FORECAST OF
INDUSTRIAL DISTRIBUTION SALES

	NB POWER	WHOLESALE	TOTAL SALES NEW BRUNSWICK
ACTUAL			
1971/72	189	36	225
1972/73	199	42	241
1973/74	205	46	251
1974/75	217	51	268
1975/76	238	57	295
1976/77	251	62	313
1977/78	255	64	319
1978/79	283	58	341
1979/80	306	58	364
1980/81	321	58	379
1981/82	293	60	353
1982/83	283	58	341
1983/84	311	60	371
FORECAST			
1984/85	321	61	382
1985/86	329	63	392
1986/87	337	64	401
1987/88	346	66	412
1988/89	354	67	422
1989/90	365	70	434
1990/91	376	72	447
1991/92	387	74	461
1992/93	399	76	475
1993/94	411	78	489
1994/95	421	80	501
1995/96	432	82	514
1996/97	442	84	527
1997/98	453	86	540
1998/99	465	89	553
99/2000	476	91	567

4. STREET LIGHTS

The sales to this customer classification include energy sold to street lights owned by NB Power and municipal utilities, customer owned facilities, off street dusk-to-dawn lights and other services such as railway crossing signals. The energy sales to this classification are just over one half of one percent of the total in-province supply.

In early and mid seventies the street lights energy requirements grew rapidly (a growth rate of 8.7% between 1970 and 1977). The growth rate since 1977 has been less than 3 percent per year. This decline in street lights energy growth rate reflects (i) slower rate of household construction, (ii) development of low wattage high efficiency lighting, (iii) financial restraints by municipal governments and (iv) development of residential areas outside municipalities not serviced by street lights.

The potential for application of more energy efficient street lights is large and expected to be realized gradually as existing lights need replacement. This will continue to offset much of the new growth in street lighting requirements.

The forecast growth rate of two (2) percent per year is in line with experience over the past four years. The forecast of total New Brunswick Street Lights sales and its NB Power and Wholesale components are given in Table 14.

TABLE 14

HISTORY AND FORECAST OF
STREET LIGHT SALES

	NB POWER	WHOLESALE	TOTAL SALES NEW BRUNSWICK
ACTUAL			
1971/72	25	11	36
1972/73	27	12	39
1973/74	30	12	42
1974/75	35	11	46
1975/76	39	11	50
1976/77	42	11	53
1977/78	44	12	56
1978/79	47	10	57
1979/80	49	10	59
1980/81	50	11	61
1981/82	51	12	63
1982/83	52	12	64
1983/84	53	12	65
FORECAST			
1984/85	55	12	67
1985/86	56	12	68
1986/87	57	13	69
1987/88	58	13	71
1988/89	59	13	72
1989/90	60	13	73
1990/91	61	14	75
1991/92	63	14	76
1992/93	64	14	78
1993/94	65	14	80
1994/95	66	15	81
1995/96	68	15	83
1996/97	69	15	84
1997/98	71	16	86
1998/99	72	16	88
99/2000	73	16	90

5. WHOLESALE (FOR RESALE)

As identified in preceeding sections a portion of the residential, general service, industrial distribution and street lights energy is not sold directly by NB Power to the customer but through two municipal utilities: Saint John and Edmundston. These utilities purchase electricity from NB Power at transmission voltages and distribute it to the ultimate consumers.

The Wholesale energy is forecast by allocating the total New Brunswick sales, for each of the four customer classifications identified above, to NB Power and Wholesale portions on the basis of historical data. Sales by municipal utilities and the related distribution losses are added to obtain the Wholesale Transmission forecast.

The Wholesale energy forecast is for a compound average annual growth rate of 3.14 percent over the next sixteen years. Forecast results are given in Table 15.

TABLE 15

HISTORY AND FORECAST OF SALES
TO WHOLESALE CUSTOMERS (GWH)

	RESIDENTIAL	GENERAL SERVICE	INDUSTRIAL DISTRIBUTION	STREET LIGHTS	TOTAL* SALES
HISTORY					
1971/72	150	167	36	11	373
1972/73	162	181	42	12	408
1973/74	179	200	46	12	450
1974/75	203	222	51	11	499
1975/76	243	252	57	11	562
1976/77	275	274	62	11	615
1977/78	278	282	64	12	633
1978/79	256	275	58	10	609
1979/80	254	288	58	10	624
1980/81	255	296	58	11	644
1981/82	263	306	60	12	659
1982/83	278	323	58	12	686
1983/84	308	341	60	12	744
FORECAST					
1984/85	330	353	61	12	782
1985/86	352	366	63	12	821
1986/87	372	380	64	13	858
1987/88	392	395	66	13	896
1988/89	409	406	67	13	926
1989/90	423	417	70	13	955
1990/91	437	428	72	14	984
1991/92	449	440	74	14	1011
1992/93	460	452	76	14	1037
1993/94	470	464	78	14	1062
1994/95	481	476	80	15	1098
1995/96	491	488	82	15	1114
1996/97	500	501	84	15	1139
1997/98	510	514	86	16	1165
1998/99	520	527	89	16	1192
99/2000	531	541	91	16	1221

* Total includes distribution losses incurred by municipal utilities.

6. INDUSTRIAL TRANSMISSION

This classification has about forty large industrial customers each with its individual substation and supplied electrical energy at transmission voltages. The customers, ranging in size from nearly one to one hundred megawatts, fall into four main industrial categories i.e. wood processing, mining, chemical (including petroleum refining) and other. There are three types of sales in this classification: (a) firm, (b) interruptible, and (c) contract.

(a) Firm Sales: Since the fiscal year 1971/72 the firm energy requirements accounting for some 90% of the sales to this classification have grown at 5.4% per year (Table 16). The growth would have been somewhat higher if the sales reduction during the 1982 recession had fully recovered by the latest fiscal year 1983/84. Corresponding period growth in the peak demand (MW) has been 5.2% per year (Table 17).

The forecast of firm sales involves, (i) an analysis of each individual customer needs in the short term (three years) and (ii) the analysis of the long term load growth prospects.

Individual customer needs are established by (i) reviewing the existing contractual agreement of peak load between NB Power and the customer, (ii) analysis of historical load patterns, (iii) customer expectations obtained through contacts with management/technical experts at customer location and (iv) impact of current economic trends on the demand for customers' products. Individual customer data is excluded from this report to maintain customer confidentiality.

TABLE 16

FIRM INDUSTRIAL TRANSMISSION ENERGY GROWTH

	Sales (GW.h)		Growth		
Industry Type	1971/72	1983/84	GW.h	GW.h/yr	%/yr
Wood	1067	2253	1186	98.9	6.4
Mining	356	604	248	20.7	4.5
Chemical	203	235	32	2.7	1.2
Other	90	129	39	3.3	3.0
TOTAL	1716	3221	1505	125.5	5.4

TABLE 17

FIRM INDUSTRIAL TRANSMISSION DEMAND GROWTH

	Peak Demand (MW)		Growth		
Industry Type	1971/72	1983/84	MW	MW/Yr	%/yr
Wood	175	355	180	15.0	6.1
Mining	58	100	41	3.4	4.5
Chemical	32	41	9	0.8	2.1
Other	23	34	11	0.9	3.3
TOTAL	289	530	241	20.1	5.2

The long term (years four to sixteen) load growth potential is based on economic, technological, resource availability and product demand considerations. As it is difficult to forecast the timing of new loads in the distant future, the load growth potential for each of the four industry groups is translated into an annual rate of growth.

Wood processing (mainly pulp and paper) industry, which comprises over two thirds of the total firm energy sales, is forecast to grow at 1.5% per year from 1987/88 to 1999/2000 (see Appendix C for details). Mining industry, accounting for some 20% of the total firm energy, is forecast to grow at 2.0% per year in the long term (see Appendix D for details). The growth for chemical and other industry groups is based mainly on economic growth potential and is also forecast at 2.0% per year.

All electric utilities frequently face requests for electrical services arising from unforeseen developments in existing or new industry. Potential load related to unforeseen developments over the forecast period is included at 5 MW/year for the years four through sixteen, amounting to a little less than one (1) percent annual increase in firm load.

The total increase in firm load forecast amounts to about 12 MW/year over the forecast period. This compares to 20.1 MW/year experienced in the past twelve years (preceeding Table 17). The difference reflects (i) slower than historical economic growth forecast and (ii) the unlikely repetition of load additions (of about 100 MW) due to modernization and expansion in the pulp and paper industry during the next sixteen years.(9)

(9) As outlined in Appendix C, due to resource considerations, the potential for growth due to modernization and expansion over the forecast period is very limited in comparison to recent experience.

The firm industrial transmission energy, including the recovery of sales reduction due to the 1982 recession, is forecast to grow at a rate of 3.0% over the next sixteen years. The forecast does not make provision for future economic swings and their effects on industrial electrical requirements because, (i) it is almost impossible to forecast the timing and duration of the economic swings and (ii) the swings have little bearing on the principal applications of this long term load forecast. Forecast results by industry group are shown in Table 18.

(b) Contract load is based on a single customer; a co-generation facility for the sale of steam and electricity from NB Power's Courtenay Bay No. 2 unit in Saint John.

(c) Interruptible power can be purchased by Industrial Transmission customers as a replacement for their own generating capacity. The forecast of 260 GW.h /year is in line with current trends and expectations.

The overall industrial transmission energy is forecast to grow at a compound average annual rate of 2.75% per year. Forecast results are shown in Table 19.

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TABLE 18

FIRM TRANSMISSION FORECAST BY INDUSTRY TYPE

FISCAL YEAR ENDING MARCH 31

INDUSTRY\YEAR:	1985	1986	1987	1988	1989 ...	1994 ...	2000
Wood Proc.:							
Peak load(mW)	350.1	351.1	351.1	356.4	361.7	389.7	426.1
Load Factor(%)	87.0	89.3	89.5	89.5	89.5	89.5	89.5
Energy(gWh)	2668.8	2747.5	2752.9	2794.2	2836.1	3055.3	3340.8
Mining:							
Peak load(mW)	93.4	97.4	99.9	101.9	103.9	114.8	129.2
Load Factor(%)	76.5	77.3	80.0	80.0	80.0	80.0	80.0
Energy(gWh)	626.3	659.5	700.0	714.1	728.4	804.2	905.7
Chemical:							
Peak load(mW)	38.7	38.7	38.7	39.5	40.3	44.5	50.1
Load Factor(%)	70.3	70.8	70.8	70.0	70.0	70.0	70.0
Energy(gWh)	238.3	239.9	239.9	242.1	246.9	272.6	307.0
Food/Other:							
Peak load(mW)	27.2	27.3	27.3	27.8	28.4	31.4	35.3
Load Factor(%)	44.7	47.8	47.8	47.9	48.0	48.5	49.1
Energy(gWh)	106.5	114.4	114.4	116.9	119.5	133.3	152.0
Sub Total:							
Peak load(mW)	509.4	514.5	517.0	525.6	534.3	580.2	640.7
Load Factor(%)	81.6	83.5	84.1	84.0	84.0	83.9	83.8
Energy(gWh)	3639.8	3761.3	3807.1	3867.2	3930.8	4265.3	4705.4
All. for Dev.:							
Peak load(mW)				5.0	10.0	35.0	65.0
Load Factor(%)				80.0	80.0	80.0	80.0
Energy(gWh)				35.0	70.1	245.3	455.5
Total:							
Peak load(mW)	509.4	514.5	517.0	530.6	544.3	615.2	705.7
Load Factor(%)	81.6	83.5	84.1	84.0	83.9	83.7	83.5
Energy(gWh)	3639.8	3761.3	3807.1	3902.3	4000.9	4510.6	5160.9

TABLE 19

HISTORY AND FORECAST OF
INDUSTRIAL TRANSMISSION SALES (GWH)

FISCAL YEAR	FIRM LOAD	CONTRACT	INTERRUP -TIBLE	TOTAL SALES
1971/72	1752	382	42	2176
1972/73	2005	388	61	2454
1973/74	2089	331	89	2509
1974/75	2232	320	99	2651
1975/76	2254	53	74	2381
1976/77	2666	75	116	2857
1977/78	2758	80	140	2978
1978/79	2872	68	168	3108
1979/80	2630	25	198	2853
1980/81	2933	75	293	3301
1981/82	2957	62	229	3248
1982/83	2517	46	233	2796
1983/84	3221	66	273	3560
FORECAST				
1984/85	3640	73	260	3973
1985/86	3761	73	260	4094
1986/87	3807	73	260	4140
1987/88	3902	73	260	4235
1988/89	4001	73	260	4334
1989/90	4101	73	260	4434
1990/91	4202	73	260	4535
1991/92	4303	73	260	4636
1992/93	4406	73	260	4739
1993/94	4510	73	260	4843
1994/95	4615	73	260	4948
1995/96	4722	73	260	5055
1996/97	4830	73	260	5163
1997/98	4939	73	260	5272
1998/99	5049	73	260	5382
99/2000	5161	73	260	5494

MONTHLY ENERGY FORECAST

In order for the load forecast to be used effectively in the overall utility planning process it is necessary to know the monthly energy consumption pattern. Annual forecast of each customer classification is allocated into months based on historical patterns and the nature of forecast growth.

Residential monthly forecast is based on weather adjusted historical data for sales in the most recent fiscal year and allocation of the forecast energy growth to its space heating and other components. Energy growth related to forecast additional electric space heating in a given year is allocated into heating months on the basis of customer consumption analysis. Non space heating energy growth is allocated uniformly throughout the twelve months.

Historical weather adjusted sales to the general service and the sales to street lights classification show a stable pattern. The annual forecast for these two classifications has been allocated over twelve months on the basis of past trends.

Some forty percent of the Wholesale energy is related to residential customers and therefore sensitive to space heating additions. Residential part of the Wholesale energy is thus allocated in the same manner as NB Power Residential sales while the remaining increase has been spread uniformly over the year.

Industrial Distribution and Transmission energy has been allocated on the basis of past patterns. However data considered abnormal due to unusual conditions, e.g. strike or economy related shutdowns, was excluded in determining historical pattern.

The monthly distribution sales, i.e. Residential, General Service, Street Lights and Industrial Distribution, were adjusted upwards for the distribution losses to determine total energy supply to these customers.

The adjustment was made on the basis of five year historical average supply to sales ratio for each month.

Total monthly in-province energy (Table 20) includes distribution supply, industrial and wholesale transmission energy and a provision for transmission losses.

TABLE 20

SYSTEM NET MONTHLY ENERGY(GWH)

YR.\MO.	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
1984/85	829	739	720	668	703	708	788	871	999	1053	942	997	10017
1985/86	860	760	737	682	717	727	813	901	1038	1094	979	1036	10344
1986/87	892	781	754	697	733	746	839	931	1078	1137	1018	1076	10682
1987/88	927	807	777	716	753	769	869	965	1122	1183	1060	1120	11068
1988/89	964	835	801	738	775	795	901	1002	1168	1231	1103	1165	11476
1989/90	994	857	821	756	794	816	926	1031	1204	1268	1138	1201	11806
1990/91	1018	875	837	770	808	832	947	1054	1233	1299	1165	1230	12070
1991/92	1045	897	857	788	827	853	971	1081	1265	1332	1196	1262	12374
1992/93	1072	918	877	806	846	873	995	1107	1297	1365	1226	1294	12675
1993/94	1098	939	896	824	864	893	1018	1133	1328	1397	1256	1325	12971
1994/95	1124	960	915	842	883	913	1041	1159	1358	1428	1284	1355	13263
1995/96	1156	986	940	865	906	939	1070	1191	1396	1468	1321	1393	13631
1996/97	1182	1008	960	883	925	959	1093	1217	1427	1499	1350	1424	13927
1997/98	1208	1029	980	902	944	980	1117	1243	1458	1531	1379	1455	14225
1998/99	1235	1051	1000	921	964	1001	1141	1270	1489	1563	1409	1486	14532
99/2000	1263	1073	1021	940	984	1023	1166	1297	1521	1596	1439	1518	14841

MONTHLY PEAK HOURLY DEMAND

The timing of new facilities depends to a large degree on the forecast of peak hourly demand on the system and its components. The most significant factor in the determination of the peak demand is the corresponding load factor.

Monthly load factors over the past five years were examined for the Distribution Energy supply and Wholesale classification. No specific trend could be established in either set of load factors. Most fluctuations were found to be weather related. Averages of the last five years load factors were used as the basis for non coincident peak demand related to Distribution and Wholesale energy.

Industrial transmission load factors are based on an analysis and projection of each individual customers load factor for the first three years of the forecast. From years four to sixteen the load factor is projected for each of the four main industrial groups. The provision for unforeseen industrial development was included at 80% annual load factor. This formed the basis of non-coincident industrial peak demand given in Table 18 on page 32. In addition a provision of 12 MW for contract load and 30 MW for interruptible load has been included to the peak demand forecast.

The total non-coincident peak demand obtained by adding variable and industrial components is adjusted for diversity and then translated to peak hourly load. Both of these adjustments are based on historical relationships. Table 21 gives the resulting forecast of system peak hourly demand.

TABLE 21

SYSTEM NET PEAK HOURLY DEMAND (MW)

YR.\MO.	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	MAX.
1984/85	1473	1346	1291	1190	1257	1310	1399	1593	1773	1832	1750	1716	1832
1985/86	1520	1376	1313	1205	1272	1333	1436	1638	1833	1894	1812	1774	1894
1986/87	1577	1416	1345	1230	1298	1368	1483	1693	1905	1968	1885	1843	1968
1987/88	1643	1466	1388	1265	1336	1413	1541	1759	1986	2051	1967	1921	2051
1988/89	1709	1518	1433	1303	1375	1460	1599	1826	2067	2134	2049	1999	2134
1989/90	1763	1561	1470	1335	1409	1500	1648	1880	2133	2201	2114	2062	2201
1990/91	1807	1595	1500	1361	1436	1532	1687	1924	2186	2255	2168	2114	2255
1991/92	1856	1635	1536	1393	1469	1570	1731	1974	2244	2314	2226	2170	2314
1992/93	1905	1676	1573	1425	1504	1608	1776	2023	2302	2372	2284	2225	2372
1993/94	1951	1715	1608	1457	1537	1645	1818	2071	2357	2428	2339	2279	2428
1994/95	1998	1754	1644	1488	1570	1683	1861	2118	2412	2484	2393	2332	2484
1995/96	2055	1802	1689	1529	1612	1729	1914	2177	2481	2553	2461	2398	2553
1996/97	2102	1841	1725	1561	1646	1767	1956	2225	2536	2608	2516	2450	2608
1997/98	2148	1881	1761	1593	1680	1805	1999	2272	2591	2664	2571	2504	2664
1998/99	2196	1922	1798	1627	1716	1844	2043	2321	2647	2720	2627	2558	2720
99/2000	2245	1963	1837	1662	1752	1885	2088	2371	2705	2779	2684	2614	2779

FORECAST SENSITIVITIES

The 1984 forecast presented in this document reflects what is considered to be the most probable outlook at this time. The effect of ±1% deviation in annual growth rate, on system net energy forecast is shown in Table 22.

TABLE 22

ENERGY FORECAST VARIATIONS

Year	(1) 1984 Forecast (GW.h)	(2) 1984 Forecast ± 1.0%/yr	(3) 1984 Forecast -1.0%/yr	(4) Differences (GW.h) (2) - (1)	(5) Differences (GW.h) (3) - (1)
1983/84 (Actual)	9261	9261	9261	-	-
1984/85 (Outlook)	10017	10110	9924	93	-93
1989/90	11806	12502	11141	696	-665
1994/95	13263	14745	11917	1482	-1346
1999/2000	14841	17322	12696	2481	-2145

Table 23 shows the effect of variations in specific forecast parameters on the total system net energy and the average annual growth rate to the end of the forecast period.

The combined effect of the changes identified in Table 23 is somewhere between -1373 GW.h and +1509 GW.h, i.e. if the actual situation were such as to render the five variables to either of the two extremes the system net energy forecast for 1999/2000 would be either higher by 1509 GW.h or lower by 1373 GW.h. The effect on annual growth rate is between +0.6% and -0.6%.

TABLE 23

SENSITIVITY TO SPECIFIC FORECAST PARAMETERS

	Forecast Variable	Input In 1984 Forecast	Change In Input Parameter	Effect on System Net Energy By Fiscal 1999/2000	
				GW.h	Annual Growth Rate (%)
(1)	Off-oil Residential Space Heat Conversions	Average of 3875/year	± 1000 Conversions	± 257	± 0.11
(2)	Natural Gas	Will affect customer decisions by 1988/89	Will not be available till year 2000	± 547	± 0.23
(3)	Conservation Effect on Space Heat Energy Requirements	0.5%/year	±0.5%/year	± 220	± 0.09
(4)	Fuel Wood Use by Residential Customers	Total quantity will remain unchanged	Will maintain its proportion of space heating energy	- 411	- 0.18
(5)	Industrial Unknown Load Additions	5 MW/year	± 5 MW/year	± 485	± 0.21

APPENDIX TO

1984 LOAD FORECAST

APPENDIX A

NUMBER OF CUSTOMERS

Residential "end use" forecast model requires a forecast of the number of year-round customers (households) and the use per customer. Customer forecast methodology is discussed in this Appendix and use per customer is the subject of the next Appendix B.

The historical growth in NB Power year-round customers can be related to (i) growth in population and (ii) the number of people per household. Since the fiscal year 1971/72 the population of New Brunswick has grown from 636,400 to 709,200 representing an average annual growth of 0.9% per year. During the same period the number of year-round residential customers has increased from 163,068 to 231,333 or at an annual rate of 3.0% per year. The higher historical growth rate for the number of customers (more than three times the population growth rate) reflects the decline in number of people per household from 3.90 to 3.07 (see Table A1). Population and household size forecasts are discussed below.

Population

Future population is a function of three factors: births, deaths and migration. The accuracy of any population forecast is therefore dependent on the ability to forecast each of these factors.

Births are a function of fertility rates and female population in the child bearing age. Fertility rate fluctuates with socio-economic conditions and is difficult to forecast. Number of deaths which depend on the mortality rate for each age group show a relatively stable trend and are more predictable. Migration patterns are generally linked to economic conditions and perhaps the most difficult component of a population forecast.

TABLE A1

POPULATION AND HOUSEHOLD HISTORY

Fiscal Year	(1) Population of New Brunswick	(2) Year-Round Customers	(1)/(2) Persons per Customer
History			
1971-72	636,400	163,068	3.90
1972-73	642,400	170,500	3.77
1973-74	649,300	179,163	3.62
1974-75	657,500	187,875	3.50
1975-76	669,200	194,749	3.44
1976-77	679,600	203,071	3.35
1977-78	685,800	209,272	3.28
1978-79	690,200	214,425	3.22
1979-80	693,800	218,319	3.18
1980-81	696,300	221,829	3.14
1981-82	698,300	224,325	3.11
1982-83	703,700	226,487	3.11
1983-84	709,200	231,333	3.07
Forecast			
1984-85	714,600	234,599	3.05
1985-86	719,900	237,918	3.03
1986-87	725,100	241,291	3.01
1987-88	730,000	244,502	2.99
1988-89	734,800	247,464	2.97
1989-90	739,300	250,218	2.95
1990-91	743,600	253,024	2.94
1991-92	747,800	255,665	2.92
1992-93	751,700	258,140	2.91
1993-94	755,400	260,404	2.90
1994-95	758,900	262,543	2.89
1995-96	762,200	264,688	2.88
1996-97	765,300	266,752	2.87
1997-98	768,400	268,821	2.86
1998-99	771,500	270,940	2.85
99-2000	774,600	273,065	2.84

The uncertainty associated with fertility rates can be avoided for the purpose of forecasting households. This is done by basing future households forecast on population of age 15 and over; the population considered capable of forming households within the duration of this sixteen year forecast.

As previously mentioned the mortality rates show a stable pattern and are relatively easy to forecast. The long term pattern for net migration is very difficult to forecast. A zero net migration assumption would minimize the overall forecast error and is therefore considered to be the best choice.

In 1982 NB Power prepared a forecast of total population and population over the age of fifteen based on the Statistics Canada projections of fertility and mortality rates and assuming zero net migration over the period. This forecast has been in line with the estimates of actual population since then.

Statistics Canada has also released (yet unpublished) a series of eighteen different population projections. We reviewed these projections and selected the best option to be the one with near zero inter-provincial migration, low international in-migration and constant fertility rate. The choice is consistent with current trends, expectations and the criteria for minimizing the forecast error. Statistics Canada projection based on the above assumptions is somewhat lower than the estimated actual at this time. NB Power's 1982 population projection, which is the same as the current estimated actual, is only slightly different from Statistics Canada projection in the long run and has therefore been used in this forecast (Table A2).

Household Size (Headship Rate)

Forecast of the number of customers is based on the headship rate (proportion of people of age 15 and over who are year-round customers) and population of age 15 and over. Headship rate history was reviewed and analyzed (Table A3). The high growth in headship rate in early and

TABLE A2

POPULATION HISTORY AND FORECAST

Fiscal Year	Population of New Brunswick	Population Growth Rate	Population Age 15 And Over	Growth Rate Age 15 And Over
History				
1971-72	636,400		434,200	
1972-73	642,400	0.94%	442,800	1.98%
1973-74	649,300	1.07%	452,100	2.10%
1974-75	657,500	1.26%	462,200	2.23%
1975-76	669,200	1.78%	476,100	3.01%
1976-77	679,600	1.55%	487,600	2.42%
1977-78	685,800	0.91%	496,600	1.85%
1978-79	690,200	0.64%	505,100	1.71%
1979-80	693,800	0.52%	513,100	1.58%
1980-81	696,300	0.36%	519,400	1.23%
1981-82	698,300	0.29%	525,400	1.16%
1982-83	703,700	0.77%	532,900	1.43%
1983-84	709,200	0.78%	539,800	1.29%
Forecast				
1984-85	714,600	0.76%	546,400	1.22%
1985-86	719,900	0.74%	553,100	1.23%
1986-87	725,100	0.72%	559,900	1.23%
1987-88	730,000	0.68%	566,300	1.14%
1988-89	734,800	0.66%	572,100	1.02%
1989-90	739,300	0.61%	577,400	0.93%
1990-91	743,600	0.58%	582,800	0.94%
1991-92	747,800	0.56%	587,800	0.86%
1992-93	751,700	0.52%	592,400	0.78%
1993-94	755,400	0.49%	596,500	0.69%
1994-95	758,900	0.46%	600,300	0.64%
1995-96	762,200	0.43%	604,100	0.63%
1996-97	765,300	0.41%	607,700	0.60%
1997-98	768,400	0.41%	611,300	0.59%
1998-99	771,500	0.40%	615,000	0.61%
99-2000	774,600	0.40%	618,700	0.60%

TABLE A3

HEADSHIP RATE HISTORY

Fiscal Year	Headship Rate (%)	Headship Growth (%)
History		
1971-72	37.556%	
1972-73	38.505%	0.949%
1973-74	39.629%	1.124%
1974-75	40.648%	1.019%
1975-76	40.905%	0.257%
1976-77	41.647%	0.742%
1977-78	42.141%	0.494%
1978-79	42.452%	0.311%
1979-80	42.549%	0.097%
1980-81	42.709%	0.160%
1981-82	42.696%	-0.013%
1982-83	42.501%	-0.195%
1983-84	42.855%	0.354%

mid seventies was not sustained in the late seventies and early eighties. The slower growth in headship rate in recent years reflects the relative stabilization in the family size at around 3 people per household. This is partly due to tougher economic times which have made it difficult for younger people to set up independent households. Forecast of headship rate is based on the trend in the past five years. Table A4 gives the forecast of population aged 15 and over, headship rate and the number of households (year-round customers).

The seasonal customers who account for some 1% of residential energy sales are forecast to increase at a rate of 200 per year (somewhat below the historical average of 300 per year experienced since 1972). Year-round, seasonal and total residential customer history and forecast is given in Table A5.

TABLE A4
YEAR-ROUND RESIDENTIAL CUSTOMERS

Fiscal Year	(1) POP. OVER AGE 15	(2) HEADSHIP RATE	(1)*(2)/100 YEAR-ROUND CUSTOMERS
History			
1971-72	434,200	37.556	163,068
1972-73	442,800	38.505	170,500
1973-74	452,100	39.629	179,163
1974-75	462,200	40.648	187,875
1975-76	476,100	40.905	194,749
1976-77	487,600	41.647	203,071
1977-78	496,600	42.141	209,272
1978-79	505,100	42.452	214,425
1979-80	513,100	42.549	218,319
1980-81	519,400	42.709	221,829
1981-82	525,400	42.696	224,325
1982-83	532,900	42.501	226,487
1983-84	539,800	42.855	231,333
Forecast			
1984-85	546,400	42.935	234,599
1985-86	553,100	43.015	237,918
1986-87	559,900	43.095	241,291
1987-88	566,300	43.175	244,502
1988-89	572,100	43.255	247,464
1989-90	577,400	43.335	250,218
1990-91	582,800	43.415	253,024
1991-92	587,800	43.495	255,665
1992-93	592,400	43.575	258,140
1993-94	596,500	43.655	260,404
1994-95	600,300	43.735	262,543
1995-96	604,100	43.815	264,688
1996-97	607,700	43.895	266,752
1997-98	611,300	43.975	268,821
1998-99	615,000	44.055	270,940
99-2000	618,700	44.135	273,065

TABLE A5

TOTAL RESIDENTIAL CUSTOMERS

Fiscal Year	(1) Year-Round Customers	(2) Seasonal Customers	(1)+(2) Total Res. Customers
History			
1971-72	163,068	11,500	174568
1972-73	170,500	11,800	182300
1973-74	179,163	12,100	191263
1974-75	187,875	12,500	200375
1975-76	194,749	12,800	207549
1976-77	203,071	13,500	216571
1977-78	209,272	13,800	223072
1978-79	214,425	14,000	228425
1979-80	218,319	14,400	232719
1980-81	221,829	14,835	236664
1981-82	224,325	14,462	238787
1982-83	226,487	15,170	241657
1983-84	231,333	15,170	246503
Forecast			
1984-85	234,599	15,370	249969
1985-86	237,918	15,570	253488
1986-87	241,291	15,770	257061
1987-88	244,502	15,970	260472
1988-89	247,464	16,170	263634
1989-90	250,218	16,370	266588
1990-91	253,024	16,570	269594
1991-92	255,665	16,770	272435
1992-93	258,140	16,970	275110
1993-94	260,404	17,170	277574
1994-95	262,543	17,370	279913
1995-96	264,688	17,570	282258
1996-97	266,752	17,770	284522
1997-98	268,821	17,970	286791
1998-99	270,940	18,170	289110
99-2000	273,065	18,370	291435

APPENDIX B

ENERGY USE PER CUSTOMER

The energy use per customer depends on the number of various electrical appliances (or equipment) in use and the average annual use per appliance.

Data on the existing number of electrical appliances in use, by year-round customer, is determined through customer surveys. The most recent such survey was conducted in November 1981 and one is scheduled for November 1984. The future saturation levels are based on estimates of each appliance's penetration into new homes and the potential for addition in existing homes. Forecast of two key residential electrical applications, which account for more than one half of the total energy use, is described in detail below.

Electric Space and Water Heating

In 1982/83 electricity was estimated to be the principal source of space heating energy for 26.9% of year-round customers. This increased to 31.1% in the next year 1983/84. The change amounted to an increase of some 11000 new electric space heat customers - 6100 from off-oil conversions and the remaining due to 100% penetration of electric heating in the 4846 new residential customers.

Some 17,000 residential customers have converted from oil to electric space heating since the implementation of the Canada Oil Substitution Program (COSP); a federal government grant program which gives customers up to $800 towards the cost of converting from oil to an alternate heating source. The current conversion rate of 6000 conversions per year is forecast to continue up to 1985/86 and then gradually decline to 3000 per year after the projected natural gas availability date.

All of the new homes are also forecast to opt for electric heating, based on the availability and economics of alternate sources. The penetration of electric heating is forecast to drop gradually, after the proposed availability of natural gas in 1989, to 65% by the fiscal year 1993/94.

The process for forecasting future numbers of electric water heating customers is similar to that for space heating. The key difference is that not all of the off-oil space heating conversions will result in additional electric water heating, since some 56% (1) of the existing oil heated customers already have an electric water heater.

Aside from the number of appliances in use we also need to know the average annual electrical use per appliance to determine the consumption per customer.

The average electrical requirement of an electric space heated home was estimated at 13,500 kW.h per year. This figure included the effect of use of wood as supplementary heating fuel in many of these homes. Estimates for electrical space heating requirements, without wood as a supplementary heating fuel, range around 17,500 kW.h/year.(2) Data on wood supply and utilization indicates that the total amount of wood used as a space heating fuel has stabilized(3) and can be expected to remain constant at this level, over the forecast period. This was confirmed by the changes in last winter's electrical consumption corresponding to the additional electrically heated homes. Electrical usage corresponding to off-oil conversion was estimated in 1982/83 at 13,500 kW.h/year based on an analysis of data for over 1000 conversions. This estimate has been revised upwards to allow for no increase in wood use.

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(1) 1981 Appliance Saturation Survey
(2) Provincial Department of the Energy Secretariat is one source of this estimate.
(3) Statistics Canada Catalogue 25-201.

In comparison to 42% of electric heated homes using wood as supplementary fuel, only about half (22%) of oil heated homes have wood as supplementary fuel.(4) Thus the electric consumption forecast for off-oil conversions is estimated at 15,500 kW.h , midway between 17,500 kW.h and 13,500 kW.h.

The effect of above changes is to increase the average annual space heating energy needs in 1983/84 from 13,265 kW.h used in the 1983 forecast to 13,742 kW.h. This input along with estimates of consumption for other applications, validates the Residential "end use" model against actual experience in fiscal 1983/84 (Table B1).

Table B2 to B4 give the results of the "end use" model for every fifth year of the forecast, showing changes in average annual use per year-round customer (household). The increasing contribution of electric space heating to the average annual consumption is related to the increasing saturation level of electric space heating which changes from 31.1% in 1983/84 to 61.2% by the end of the sixteen year forecast.

Consumption per seasonal customer is forecast to increase at 50 kW.h per year from the 2020 kW.h level in 1983/84. This change is in line with recent experience.

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(4) 1981 Appliance Saturation Survey 1981.

TABLE B1

END USE ESTIMATES FOR RESIDENTIAL ELECTRICAL USE
FISCAL YEAR 1983/84

ELECTRICAL APPLIANCE OR EQUIPMENT	SATURATION LEVEL	ANNUAL APPLIANCE CONSUMPTION (kWh)	CONTRIBUTION TO AVERAGE HOUSEHOLD CONSUMPTION (kWh)	% OF TOTAL
(1) HEATING SYSTEM	31.1%	13742	4272	35.8
(2) WATER HEATER	69.1%	3920	2711	22.7
(3) REFRIGERATOR	100.0%	1250	1250	10.5
(4) COOKING STOVE	91.5%	1140	1044	8.7
(5) FREEZER	61.8%	850	525	4.4
(6) DISHWASHER	32.0%	360	115	1.0
(7) CLOTHES WASHER	85.4%	90	77	0.6
(8) CLOTHES DRYER	73.6%	900	662	5.5
(9) TELEVISION	100.0%	376	376	3.1
(10) AIR CONDITIONER	6.3%	500	32	0.3
(11) LIGHTING	100.0%	600	600	5.0
(12) MISCELANEOUS	100.0%	282	282	2.4
(13) TOTAL			11946	100.0

TABLE B2

END USE ESTIMATES FOR RESIDENTIAL ELECTRICAL USE
FISCAL YEAR 1988/89

ELECTRICAL APPLIANCE OR EQUIPMENT	SATURATION LEVEL	ANNUAL APPLIANCE CONSUMPTION (kWh)	CONTRIBUTION TO AVERAGE HOUSEHOLD CONSUMPTION (kWh)	% OF TOTAL
(1) HEATING SYSTEM	46.3%	14304	6616	44.7
(2) WATER HEATER	75.8%	3920	2973	20.1
(3) REFRIGERATOR	100.0%	1282	1282	8.7
(4) COOKING STOVE	97.4%	1085	1056	7.1
(5) FREEZER	70.0%	829	580	3.9
(6) DISHWASHER	39.4%	360	142	1.0
(7) CLOTHES WASHER	84.4%	90	76	0.5
(8) CLOTHES DRYER	77.3%	900	695	4.7
(9) TELEVISION	100.0%	395	395	2.7
(10) AIR CONDITIONER	7.4%	500	37	0.3
(11) LIGHTING	100.0%	600	600	4.1
(12) MISCELANEOUS	100.0%	360	360	2.4
(13) TOTAL			14812	100.0

TABLE B3

END USE ESTIMATES FOR RESIDENTIAL ELECTRICAL USE
FISCAL YEAR 1993/94

ELECTRICAL APPLIANCE OR EQUIPMENT	SATURATION LEVEL	ANNUAL APPLIANCE CONSUMPTION (kWh)	CONTRIBUTION TO AVERAGE HOUSEHOLD CONSUMPTION (kWh)	% OF TOTAL
(1) HEATING SYSTEM	54.1%	14227	7701	47.5
(2) WATER HEATER	78.6%	3920	3083	19.0
(3) REFRIGERATOR	100.0%	1314	1314	8.1
(4) COOKING STOVE	99.2%	1031	1023	6.3
(5) FREEZER	76.2%	808	616	3.8
(6) DISHWASHER	45.6%	360	164	1.0
(7) CLOTHES WASHER	83.7%	90	75	0.5
(8) CLOTHES DRYER	79.3%	900	714	4.4
(9) TELEVISION	100.0%	415	415	2.6
(10) AIR CONDITIONER	8.5%	500	42	0.3
(11) LIGHTING	100.0%	600	600	3.7
(12) MISCELANEOUS	100.0%	459	459	2.8
(13) TOTAL			16206	100.0

TABLE B4

END USE ESTIMATES FOR RESIDENTIAL ELECTRICAL USE
FISCAL YEAR 1998/99

ELECTRICAL APPLIANCE OR EQUIPMENT	SATURATION LEVEL	ANNUAL APPLIANCE CONSUMPTION (kWh)	CONTRIBUTION TO AVERAGE HOUSEHOLD CONSUMPTION (kWh)	% OF TOTAL
(1) HEATING SYSTEM	60.1%	14020	8424	49.0
(2) WATER HEATER	80.6%	3920	3160	18.4
(3) REFRIGERATOR	100.0%	1347	1347	7.8
(4) COOKING STOVE	99.7%	981	978	5.7
(5) FREEZER	80.1%	788	631	3.7
(6) DISHWASHER	50.8%	360	183	1.1
(7) CLOTHES WASHER	83.1%	90	75	0.4
(8) CLOTHES DRYER	81.1%	900	730	4.2
(9) TELEVISION	100.0%	437	437	2.5
(10) AIR CONDITIONER	9.4%	500	47	0.3
(11) LIGHTING	100.0%	600	600	3.5
(12) MISCELANEOUS	100.0%	586	586	3.4
(13) TOTAL			17178	100.0

APPENDIX C

WOOD PROCESSING INDUSTRY

Wood processing related firm industrial transmission sales have grown from 1067 GW.h to some 2250 GW.h between the fiscal years 1971/72 and 1983/84. The 1983/84 sales were some 70% of the firm industrial transmission sales (up from 62% in 1971/72) and 24.3% of the total in-province supply. Most (about 97%) of the electrical sales to the wood processing industry are to the province's eleven pulp and paper mills and the remaining 3% are to lumber, plywood and flakeboard manufacturers. The following discussion focusses on the long term prospects of the pulp and paper industry and its implications for the industrial load forecast.

The five key considerations which are forecast to affect the industry's electrical load requirements are (i) availability of the resource, (ii) demand for the industry's product (iii) further processing of the final product and (iv) effects of mill modernization and (v) effects of new electro-technology such as high temperature heat pumps.

(i) Resources: Extensive empirical and scientific research related to the availability of wood has been done by the New Brunswick Department of Natural Resources (DNR). Findings of this research indicate that:

"...no immediate problem with wood supply and, even in the worst situation, no problems closer than 15-20 years".[1]

Wood supply to support the existing industry was therefore not considered to be a constraint in forecasting the load for this industry. Prudent planning however dictates the need to examine the industry's prospects beyond the sixteen year period. The above mentioned DNR report indicates that under current forest management practices, the province will experience a slight shortage of wood in the period between 30

(1) Good Forest Management - A Committment to Action, New Brunswick Department of Natural Resources.

and 40 years from now. However, there is no imminent depletion of the resource and the industry should therefore continue to be a large consumer of electricity.

The DNR findings also indicate a small excess of hardwood supply, most suitable for fiber based products,[2] which could allow companies using hardwood to increase output. Potential related load addition is estimated at 8 MW.

(ii) Product Demand: Food and Agriculture Organization (FAO) of the United Nations does extensive research on the pulp and paper industry. FAO estimates indicate that the product demand in Canada's main markets, i.e. North America, West Europe and Japan, will increase by an average of little over 3 percent annually[3]. This should allow cost competitive New Brunswick producers to maintain the current levels of export and possibly capture some of the growth.

One important development related to potential markets is proposed quota on Canadian newsprint imports by the European Economic Community (EEC). The current quota for 1984 is 570,000 tonnes. This compares to some 700,000 tonnes[4] shipped by the Canadian producers in 1983. Negotiations are underway between the Canadian and EEC officials and there is also some pressure by EEC member countries to remove this quota.[5] This load forecast assumes that the proposed quota will not affect markets for N.B. produced newsprint and that if it does the producers will be able to find new markets.

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(2) New Brunswick Forest Industry and Forest Resources; Department of Natural Resources, New Brunswick.
(3) Interim Report of the Forest Industries Advisory Committee to the Honourable Edward C. Lumley, Minister of Industry Trade and Commerce and Regional Economic Expansion.
(4) Source: Canadian Pulp and Paper Association
(5) See the Globe & Mail, September 25, 1984, pp. B3

(iii) **Further Product Processing:** One example of further processing involves a recent proposal to produce light weight coated paper by integrating the kraft pulp and groundwood pulp from two existing mills. This could add an additional 20 MW of electrical load.

(iv) **Mill Modernization:** Modernization at many of New Brunswick mills, as a result of $780 million program[6] started in 1979, has resulted in process change and additional electrical loads. Two key load additions, amounting to some 85 MW, came into effect in 1983. Modernization work is in study stages at three other mills and could lead to further increase of up to 30 MW.

(v) New Technology: Application of electrically driven heat pumps and mechanical vapor recompression equipment to utilize the waste heat in the exhaust steam is supported by recent research.[7] The potential load in newsprint mills through heat pump applications has been estimated at 40 MW.[8] The potential for heat pumps in the Kraft Mills is yet unestablished but the subject of a Canadian Electrical Association research project in progress.

(6) The Globe and Mail Report on the Forest Industry, July 25, 1983.
(7) Heat Pumping in Industry - A State of the Art Study, C.E.A. Research Report 130 USA.
(8) Potential for Electric Heat Pumps in the Canadian Newsprint Industry, C.E.A. Research Report 124 U 291.

APPENDIX D

MINING AND SMELTING INDUSTRY

Mining and smelting related firm industrial transmission sales have grown from 356 GW.h to some 605 GW.h between the fiscal years 1971/72 and 1983/84. The 1983/84 mining related sales were some 20% of the firm industrial transmission sales and 6.5% of the total in-province supply.

The key considerations which are forecast to affect the industry's electrical load requirements are (i) the potential for new mines, (ii) re-opening of existing mines closed by the decline in the world prices of some minerals and (iii) the potential for further electrification of the mining industry by application of new electro-technologies.

(i) New Mines: Three new potash mines[1] and one tungsten/molybdenum mine have recently started or are expected to start operations within the next five years. One potash mine reached planned production level in 1984 while a second is scheduled to begin operations in the spring of 1985. Work on the third mine is in exploratory stages and potential production is likely to be sometime in the late eighties. A tungsten/molybdenum mine also started production in 1983.

The energy forecast related to the potash mine is based on estimates of planned connected loads and load factors. These estimates have been reconciled with available data on kW.h per tonne of potash. Actual production experience will be used to refine this forecast. Electrical forecast of the tungsten/molybdenum mine is based on experience so far and changes projected by the Company.

(1) For more details on potash development in New Brunswick see Minerals Strategy Update, 1982, Department of Natural Resources.

(ii) Re-opening Existing Mines: In May 1983 one New Brunswick Mine, temporarily stopped production in response to the depressed world price for zinc and copper - the two main ingredients in the mine's ore body. The load reduction related to this closure was partly offset by gold and silver leaching operation which are now nearly complete. The mine is forecast to resume partial production upon completion of the leaching operation. The recovery in world price of antimony[2] has led to plans for re-opening of another New Brunswick mine which was closed in May 1981. The related load has been included in this forecast.

(iii) Further Electrification: The load at the existing lead smelter may increase if the new technology[3] (developed by the New Brunswick Research and Productivity Council), which is expected to increase metal recovery rate, is adopted over the next few years.

Potential for using electrically operated mining and material handling equipment, use of electricity for underground space heating and the application of heat pumping technology[4] are other areas which would lead to growth in the mining related electrical load. Much of this potential load is not yet quantifiable and has therefore not been included directly in the mining sector's load forecast. For now the provision for such loads is included in the allowance of 5 MW/year for unknown industrial developments.

(2) The Globe & Mail, July 30, 1984, pp. B5
(3) See the 12th in a series of articles on the mining and smelting industry by A.E. Luetchford, the Daily Gleaner, April 26, 1983.
(4) Canadian Electrical Association has awarded a Research Project to estimate the potential load related to heat pump application in the mining industry.